3. CAPE COD TO SANDY HOOK

(1) The Atlantic coast from Cape Cod to Sandy Hook embraces part of the coast of Massachusetts and all of the coasts of Rhode Island, Connecticut, and New York. To the mariner this area presents problems of unusual difficulty because of the off-lying shoals, strong and variable currents, large amounts of fog, and turbulence of wind and sea in the great storms that so frequently sweep it. Additionally, the mariner is faced with the great volume of waterborne traffic that moves through the area to and from the Port of New York.

(2) **Prominent features.**–The principal geographic features include Georges Bank, Nantucket and Vineyard Sounds, Buzzards Bay, Narragansett Bay, Long Island Sound and tributaries, and New York Harbor and tributaries including the Hudson River.

(3) Cape Cod, a long peninsula jutting eastward from the mainland of Massachusetts, may be likened to an arm bent upward at the elbow. It was originally formed by the last great glacier and has been refashioned by the seas and wind. The outer end of The Cape, as it is called by eastern New Englanders, is a barren region of sand dunes with long yellow beaches, while much of the remainder of the forearm is bleak grassy country. The southern side of the deltalike plain of Cape Cod has been cut along high bluffs by the surf and waves. This section of the coast is covered with growth of pitch pine and scrub oak.

(4) Nantucket, Martha's Vineyard, the Elizabeth Islands, and numerous smaller islands were also formed by the glacier. The plains of Martha's Vineyard and Nantucket are broad grassy heaths. The Elizabeth Islands are hilly and partly wooded, and generally the shores are low bluffs.

(5) The western shore of Buzzards Bay is of moderate height, very gently sloping, cleared, and cultivated with occasional groves of trees. Several towns and the city of New Bedford are visible along the shores.

(6) Between Buzzards and Narragansett Bays the coast is a mass of sand dunes with steep faces forming a line along the shore. Several headlands along this stretch of coast have fine sand beaches between them.

(7) The boundary line between Massachusetts and Rhode Island strikes the coast just westward of Quicksand Point.

(8) Among the islands in Narragansett Bay are Rhode (Aquidneck) Island, Conanicut, and Prudence. These rather large islands are gently sloping, undulating, and covered with cultivated fields and orchards, and occasional groves of trees.

(9) Westerly from Point Judith to Napatree Point is a continuous line of beaches behind which are many saltponds. These ponds have been formed by the sea breaking through the outer sand barrier and then depositing sand to close the opening. The shore near the water is low, grassy, and nearly level, but gradually rises with a series of gentle curves to higher wooded lands some distance back.

(10) Block Island is another formation of the glacier. A prominent feature of the island is the entire absence of trees. The surface when viewed from eastward has a grassy undulating appearance, and the hills in many places show steep sandy faces. Near the shoreline the land is low, but rapidly rises toward the center of the island to steep hills covered only with grass and dotted occasionally with houses.

(11) The boundary line between Rhode Island and Connecticut follows the Pawcatuck River to above the head of navigation.

(12) The coastline of Connecticut is rockbound and rugged, with numerous sandy beaches and occasional salt meadows or marshland. The surface is mildly rolling near the shore. The depression of small valleys along the shore has created a number of good harbors. The shoreline has been well developed commercially and residentially. It is lined with seaside resorts, State parks, and bathing beaches.

(13) The boundary line between Connecticut and New York follows the Byram River for slightly over 1 mile.

(14) Long Island, originally formed by the glacier and thrusting about 105 miles eastward from New York Bay to a point abreast of New London, faces the New England coast across Long Island Sound on the north. The long, narrow outline of the island resembles that of a whale. Its eastern end is split by Peconic Bay and the 35- and 25-mile peninsulas thus formed are the north and south flukes. The island is almost a plain. On the north coast, bluffs rise to a height of 200 feet. South of these, extending well into the island's midsection, run several chains of hills. The south shore is a barrier beach from about 30 miles west of the eastern extremity to the western end, which has been developed into a series of bathing resorts.

(15) **Disposal Sites** and **Dumping Grounds.**–These areas are rarely mentioned in the Coast Pilot, but are shown on the nautical charts. (See Disposal Sites and Dumping Grounds, chapter 1, and charts for limits.)

(16) **Aids to navigation.**–Lights, radiobeacons, and buoys are the principal guides that mark the approaches to the important harbors. Many of the light stations have fog signals and radiobeacons, particularly those in the vicinity of the larger ports.

(17) (See the Light List for a complete description of navigational aids.)

(18) **Loran.**–Loran C provides the mariner with good navigation coverage along this section of the coast.

(19) **Radar** is an important aid in most of this area, but should not be relied upon for ranges to the beach in areas such as the south coast of Long Island which offer a relatively low relief. Many of the coastal buoys are equipped with radar reflectors. Radar is of particular importance in detecting other traffic and in the prevention of collisions during periods of low visibility, which are common in this area.

(20) **COLREGS Demarcation Lines.**–Lines have been established to delineate those waters upon which mariners must comply with the Inland Navigational Rules Act of 1980 (Inland Rules). The waters inside of the lines are **Inland Rules Waters,** and the waters outside of the lines are **COLREGS Waters.** (See **Part 80,** chapter 2, for specific lines of demarcation.)

(21) **Ports and Waterways Safety.**–(See **Part 160**, chapter 2, for regulations governing vessel operations and requirements for notification of arrivals, departures, hazardous conditions, and certain dangerous cargoes to the Captain of the Port.)

(22) **Regulated Navigation Areas** have been established within the navigable waters of the First Coast Guard District to increase operational safety for towing vessels and tank barges. (See **165.100**, chapter 2, for limit and regulations.)

(23) **Harbor entrances.**–The entrances to most of the harbors have dredged channels marked with navigational aids and are easy of access. In some cases jetties and breakwaters extend offshore from the entrances. The entrances to the inlets along the

south shore of Long Island are subject to frequent change due to the shifting sand bars.

(24) **Traffic Separation Schemes (Traffic Lanes)** have been established in the approaches to Buzzards Bay, Narragansett Bay, and New York Harbor. (See chapters 5, 6, and 11, respectively, for details.)

(25) **Vessel Traffic Service, New York**, operated by the U.S. Coast Guard, serves New York Harbor. (See **161.1 through 161.25**, chapter 2, for regulations.)

(26) **Channels.–Federal project depth** is the dredging depth of a channel as authorized by an Act of Congress upon recommendation of the Chief of Engineers, U.S. Army. **Controlling depth** in a channel is its least depth; it restricts use of the channel to drafts less than that depth.

(27) Where deepwater channels are maintained by the Corps of Engineers and the controlling depths are printed on the charts in tabular form, the Coast Pilot usually gives only the project depths. Owing to constant shoaling in places, depths may vary considerably between maintenance dredgings; consult the Notice to Mariners for channel depths subsequent to charted information.

(28) Where secondary channels are maintained regularly by the Corps of Engineers, the Coast Pilot gives the controlling depths together with the dates of the latest surveys.

(29) In the case of other channels, the controlling depths printed in the Coast Pilot are from the latest available reports which may, however, be several years old.

(30) **Anchorages.**–There are numerous anchorages in Nantucket and Vineyard Sounds, Buzzards, Narragansett, and Gardiners Bays, and Long Island Sound, where vessels with good ground tackle can ride out any gale. Between Cape Cod and Sandy Hook, the more important harbors, either commercially or as harbors of refuge, are New Bedford, Newport, Providence, New London, New Haven, and Bridgeport on the mainland, Greenport and Port Jefferson on Long Island, City Island, New York, and vast New York Harbor. (See **Part 110,** chapter 2, for limits and regulations.)

(31) **Dangers.**–The most important dangers confronting the navigator when approaching the area are the great banks and shoals in the eastern approach. The remainder of the isolated dangers throughout the area and in the approaches to the harbors are for the most part well marked and charted.

(32) **Pipelaying barges.**–With the increased number of pipeline laying operations, operators of all types of vessels should be aware of the dangers of passing close aboard, close ahead, or close astern of a jetbarge or pipelaying barge. Pipelaying barges and jetbarges usually move at 0.5 knot or less and have anchors which extend out about 3,500 to 5,000 feet in all directions and which may be marked by lighted anchor buoys. The exposed pipeline behind the pipelaying barge and the area in the vicinity of anchors are hazardous to navigation and should be avoided. The pipeline and anchor cables also represent a submerged hazard to navigation. It is suggested, if safe navigation permits, for all types of vessels to pass well ahead of the pipelaying barge or well astern of the jetbarge. The pipelaying barge, jetbarge, and attending vessels may be contacted on VHF-FM channel 16 (156.80 MHz) for passage instructions.

(33) **Northern right whales** are the world's most endangered large whale. The population, perhaps fewer than 300 animals, occurs along the east coast of the United States and Canada. Because right whales mate, rest, feed, and nurse their young at the surface, and often do not move out of the way of oncoming ships, they are highly vulnerable to being struck by ships. Ship strikes are one of the known sources of human-related mortality.

(34) *Seasonal occurrence of northern right whales*: In seasons and in areas that right whales may occur, vessel operators should maintain a sharp lookout for right whales. Right whales occur seasonally in Cape Cod Bay (peak season: January through April), the Great South Channel (peak season: April through June), Stellwagen Bank (peak season: July through September), Jefferys Ledge (peak season: July through mid-December), and the Bay of Fundy (Grand Manan Basin) (peak season: June through December). The first two areas are federally designated critical habitats for right whales. Stellwagen Bank and Jefferys Ledge are located in the federally designated Gerry E. Studds Stellwagen Bank National Marine Sanctuary. The Grand Manan Basin is a Canadian whale conservation area. Seasonal right whale advisories and sighting reports are broadcast periodically for these areas by Coast Guard Broadcast Notice to Mariners, NAVTEX, NOAA Weather Radio, Cape Cod Canal Vessel Traffic Control, the Bay of Fundy Vessel Traffic Control, and other means.

(35) *Description of northern right whale*: The species reaches lengths of 45 to 55 feet and is black in color. The best field identification marks are a broad back with no dorsal fin, irregular bumpy white patches (callosities) on the head, and a distinctive two-column V-Shaped below. They have paddle like flippers nearly as wide as they are long, and a broad, deeply notched tail, see diagrams following.

(36) *Early Warning System*: As weather and conditions permit, a dedicated seasonal-program of overflights and vessel surveys (principally in Cape Cod Bay and the Great South Channel) provide whale sighting information to the Coast Guard, NOAA Weather Radio, and others for broadcast purposes. Many right whales however, go undetected.

(37) *Precautions*: The National Marine Fisheries Service's Northeast Implementation Team recommends the following precautionary measures be taken to avoid northern right whales.

When transiting right whale critical habitat:

(38) As soon as possible prior to entering right whale critical habitat, check Coast Guard Broadcast Notice to Mariners, NAVTEX, NOAA Weather Radio, Cape Cod Canal Vessel Traffic Control, the Bay of Fundy Vessel Traffic Control, and other sources for recent right whale sighting reports.

(39) To the extent possible, review right whale identification materials and maintain a sharp watch with lookouts familiar with spotting whales.

(40) When planning passage through a right whale critical habitat, attempt to avoid night-time transits, and whenever practical, minimize travel distances through the area. Anticipate delays due to whale sightings.

(41) When the ability to spot whales is reduced (e.g. night, fog, rain, etc.), mariners should bear in mind that reduced speed may minimize the risk of ship strikes. Two of the best documented ship strikes involve a juvenile right whale struck and killed by a vessel proceeding at 15 knots and an unidentified whale, possibly a humpback whale, struck but not re-sighted by the vessel, also moving at 15 knots.

In all coastal and offshore waters along the east coast:

(42) If a right whale sighting is reported within 20-nautical miles of a ship's position, post a lookout familiar with spotting whales.

(43) If a right whale is sighted from the ship, or reported along the intended track of a large vessel, mariners should exercise caution and proceed at a safe speed within a few miles of the sighting location, bearing in mind that reduced speed may minimize the risk of ship strikes.

(44) Do not assume right whales will move out of your way. Right whales, generally slow moving, seldom travel faster than 5-6 knots. Consistent with safe navigation, maneuver around observed right whales or recently reported sighting locations. It is illegal to approach closer than 500-yards of any right whale (see **50 CFR 222.32**, Chapter 2).

(45) Any whale accidentally struck, any dead whale carcass, and any whale observed entangled should be reported immediately to the Coast Guard noting the precise location and time of the accident or sighting. In the event of a strike or sighting, the following information should be provided to the Coast Guard:

(46) location and time of the accident or sighting,
(47) speed of the vessel,
(48) size of the vessel,
(49) water depth,
(50) wind speed and direction,
(51) description of the impact,
(52) fate of the animal, and
(53) species and size, if known.

(54) Right whales can occur anywhere along the east coast. Therefore, mariners are urged to exercise prudent seamanship in their efforts to avoid right whales.

(55) **Mandatory Ship Reporting Systems**

(56) **(WHALESNORTH and WHALESSOUTH)**, have been established within the area of this Coast Pilot. These Mandatory Ship Reporting (MSR) systems require all vessels, 300 gross tons or greater, to report to the U.S. Coast Guard prior to entering two designated reporting areas off the east coast of the United States. **(See 33 CFR 169**, chapter 2, for limits and regulations.) Sovereign immune vessels are exempt from the requirement to report, but are encouraged to participate.

(57) The two reporting systems will operate independently of each other. The system in the northeastern United States will operate year round and the system in the southeastern United States will operate each year from November 15 through April 15. Reporting ships are only required to make reports when entering a reporting area during a single voyage (that is, a voyage in which a ship is in the area). Ships are not required to report when leaving a port in the reporting area nor when exiting the system.

(58) Vessels shall make reports in accordance with the format in IMO Resolution A.858 (20) in accordance with the International Convention for the Safety of Life at Sea 1974 (SOLAS 74). (See **33 CFR 169.135 and 169.140**, chapter 2, for additional information.) Vessels should report via INMARSAT C or via alternate satellite communications to one of the following addresses:

(59) Email: RightWhale.MSR@noaa.gov or Telex: 236737831

(60) Vessels not equipped with INMARSAT C or Telex should submit reports to the U.S. Coast Guard's Communication Area Master Station Atlantic (CAMSLANT) via narrow band direct printing (SITOR) or HF voice. Vessels equipped only with VHF-FM voice communications should submit reports to the nearest U.S. Coast Guard activity or group.

(61) Example Reports:
(62) **WHALESNORTH**-To: RightWhale.MSR@noaa.gov
(63) WHALESNORTH//
(64) M/487654321//
(65) A/CALYPSO/NRUS//
(66) B/031401Z APR//
(67) E/345//
(68) F/15.5//
(69) H/031410Z APR/4104N/06918W//
(70) I/BOSTON/032345Z APR//
(71) L/WP/4104N/06918W/15.5.//
(72) L/WP/4210N/06952W/15.5//
(73) L/WP/4230N/07006W/15.5//
(74) **WHALESSOUTH**-To: RightWhale.MSR@noaa.gov
(75) WHALESSOUTH//
(76) M/412345678//
(77) A/BEAGLE/NVES//
(78) B/270810Z MAR//
(79) E/250//
(80) F/17.0//
(81) H/270810Z MAR/3030N/08052W//
(82) I/MAYPORT/271215Z MAR//
(83) L/RL/17.0//.

(84) **Charts 13204, 13200.–Georges Bank** is an extensive bank with depths of less than 50 fathoms, extending for over 150 miles northeastward from the offshore end of Nantucket Shoals.

(85) In heavy weather the danger area may be considered to be the oval-shaped top of the bank which is about 80 miles long in a northeast and southwest direction and which has a maximum width of about 50 miles. The bottom within this area is extremely broken and irregular, with a great number of ridges and shoal spots having depths of less than 10 fathoms. Between these shoals are channels of varying widths in which depths of about 20 fathoms may be found. All of this area lies within the 30-fathom curve and so much of it has depths of less than 20 fathoms that it may practically all be considered to lie within a generalized 20-fathom curve.

(86) On the southeast side of the bank, outside the 20-fathom curve, the water deepens gradually and with such regularity that soundings would be of considerable value in approaching the bank. On the northwest side the water deepens more rapidly.

(87) The bottom is generally of sand, sometimes with shell, and in places pebbles. Bottom samples as obtained during surveys are shown in a great many places on the charts.

(88) The two principal dangers on Georges Bank are Georges Shoal and Cultivator Shoal, which are near the center of the danger area. Around these shoals the sea breaks in depths of 10 fathoms during heavy weather, and the locality should be avoided by deep-draft vessels.

(89) **Georges Shoal** is a ridge about 13 miles long on which are several shallow depths of 1½ to 3 fathoms.

(90) **Cultivator Shoal**, about 20 miles westward of Georges Shoal, is a ridge nearly 15 miles long, on which depths of 3 to 10 fathoms are found. The 3-fathom spot is near the north end of the shoal. In December 1980, a submerged obstruction was reported about 8.7 miles northwest of the 3-fathom spot in about 41°43'N., 68°23'W.; vessels engaged in bottom operations are advised to exercise caution in the area.

(91) The entire area within the 20-fathom curve has an extremely broken bottom. There are numerous ridges and shoal spots on which depths dangerous to navigation, particularly in heavy weather, may be found. These shoal spots generally have steep sides, and very little or no indication of their existence is given by soundings. Tide rips and swirls, as well as overfalls, are common in the vicinity of these spots, but are not always visible. They show best with a smooth sea and with the current flowing in certain directions. These disturbances are not usually over the shoalest depths, but are commonly alongside them. Small, detached overfalls may be seen in 20 fathoms of water. The tidal currents are rotary with no period of slack water. The velocity at strength is about 2 knots, and the velocity of the minimum current which occurs about midway between the times of strength is about 1 knot. The hourly velocities and directions of the tidal current are shown by means of current roses on National Ocean Service charts.

(92) A navigator must bear in mind while in an area of this character that it is impossible for the surveyor, without a vast expenditure of time, to determine and locate all of the shoalest spots on the many dangerous shoals found. Sudden shoaling on such a bank must be considered an indication of possibly dangerous water. This bank has not been wire dragged.

(93) **Nantucket Shoals** is the general name of the numerous different broken shoals which lie southeastward of Nantucket Island and make this one of the most dangerous parts of the coast of the United States for the navigator. These shoals extend 23 miles eastward and 40 miles southeastward from Nantucket Island. They are shifting in nature, and the depths vary from 3 to 4 feet on some to 4 and 5 fathoms on others, while slues with depths of 10 fathoms or more lead between those farthest offshore. The easterly edge of the shoals has depths of 3 and 4 fathoms in places.

(94) **Area to be avoided.**–Because of the great danger of stranding and for reasons of environmental protection, the International Maritime Organization (IMO) has established an area to be avoided in the area of Nantucket Shoals. All vessels carrying cargoes of oil or hazardous materials and all other vessels of more than 1,000 gross tons should avoid the area bounded by the following points:

(95) 41°16.5'N., 70°12.5'W.;
(96) 40°43.2'N., 70°00.5'W.;
(97) 40°44.5'N., 69°19.0'W.;
(98) 41°04.5'N., 69°19.0'W.;
(99) 41°23.5'N.; 69°31.5'W.; and
(100) 41°23.4'N., 70°02.8'W.

(101) The currents in the area are strong and erratic, reaching a velocity of 3 to 5 knots around the edges of the shoals. They are made erratic by the obstruction of the shoals, in some cases being deflected to such an extent as to cause the direction to change 180° from one side of the shoal to the other.

(102) The tidal current over the shoals is rotary, turning clockwise. Observations in the area indicate an average velocity at strength of about 2.5 knots, but this probably varies appreciably from place to place. Similarly the direction of the current at strength probably depends on the orientation of channels between shoal areas.

(103) Since the current is rotary, there is no true slack. Observations in the area show an average minimum of about 0.5 knot.

(104) The tidal current near Nantucket Shoals Lighted Horn Buoy N is rotary, turning clockwise. The average velocity at strength is 0.8 knot; the average minimum is 0.6 knot.

(105) Hourly average velocities and directions for Davis Bank and the area near Nantucket Shoals Lighted Horn Buoy N, referred to predicted times of maximum flood at Pollock Rip Channel, are furnished in the Tidal Current Tables. However the tidal currents are appreciably influenced by winds.

(106) Nantucket Shoals should be entirely avoided by deep-draft vessels when possible and by light-draft vessels without local knowledge, on account of the treacherous currents. There are, however, channels through these various shoals which can be negotiated with local knowledge and caution. In calm weather at slack water these shoals are sometimes difficult to see, and a vessel is liable to be taken into shoaler water than was intended.

(107) Calm, clear days are few; when the sea is calm it is usually foggy, and when clear, it is usually rough. Also to be expected is a considerable amount of hazy weather, which limits visibility.

(108) Should it become necessary to anchor in this area, open sea anchorage may be had anywhere that depths permit. Due consideration should be given to the close proximity of shoals and possibility of dragging due to the winds and currents. Generally it has been found best to avoid the deeper channels and, when rougher water is experienced, to anchor in the lee of a shoal, which would tend to knock down the heavier swells. A scope of five to one or greater should always be used.

(109) **Nantucket Shoals Lighted Horn Buoy N** (40°30'N., 69°26'W.), replacing Nantucket Shoals Lightship, is a large navigational buoy (LNB) about 51 miles south-southeastward of Nantucket Island. The buoy, 40 feet in diameter, is red with the words U.S. COAST GUARD on the buoy body and the letter N

on the daymarks. The buoy shows a light 40 feet above the water and is equipped with a fog signal, a radiobeacon, and a radar beacon (Racon).

(110) Nantucket Shoals is made up of the following parts:

(111) This buoy is centered inside the traffic separation zone of the traffic separation lanes of "Eastern Approach Off Ambrose" to the "Traffic Separation Scheme Off New York". (See charts 12300 and 13006.)

(112) **Phelps Bank**, the southeasternmost part of the Nantucket Shoals, is about 6.5 miles long and 2.5 miles wide. A lighted whistle buoy, marking the entrance to the Boston Harbor Traffic Separation Scheme, is about 12 miles eastward of Phelps Bank.

(113) **Asia Rip**, the shoalest point of the bank with 5 ¾ fathoms, is at the southern end. The wreck of the SS OREGON, covered 3 ¼ fathoms, is at 40°45'N., 69°19' W., 3 miles south-southeastward of Asia Rip. A lighted gong buoy is about 1 mile southward of the wreck.

(114) **Middle Rip**, with a least-found depth of 4 fathoms and lying north-northwest of Phelps Bank, is about 13.5 miles long and 4.5 miles wide. This shoal consists of two large parts with depths of 4 fathoms on the east and 6¼ fathoms on the west, separated by a channel with a depth of 7 fathoms and four outlying shoals of 8 to 10 fathoms.

(115) **Fishing Rip**, bow-shaped, with depths of 3 to 10 fathoms, is about 26 miles long north and south and 6.5 miles wide at its widest point. The north point is 20 miles 073° and the south point is 27.5 miles 136°, respectively, from Sankaty Head Light. A large wreck area, marked by a lighted gong buoy, is near the southern part of Fishing Rip. A wreck and a submerged obstruction are also near the southern portion of the rip in about 41°00.0'N., 69°27.0'W. and 41°01.0'N., 69°29.7'W., respectively.

(116) The unmarked channel westward of Fishing Rip is obstructed by three shoals in the northern section which have least-found depths of 7½, 4½, and 10 fathoms. In the southern part of this channel are four shoals with depths of 8 to 10 fathoms.

(117) **Davis Bank**, the innermost of the outer Nantucket Shoals, is bow-shaped and has depths of 2¾ to 10 fathoms of water over it. The bank is about 30 miles long north and south and has a greatest width of 4 miles. The wreck of the vessel PROGRESS is off the inner edge of the bank about 13 miles north-northeastward of the southern end of the bank.

(118) The channel westward of Davis Bank is marked on its west side by lighted and unlighted buoys. A radar beacon (Racon) is at the northernmost lighted buoy. The use of this channel should be restricted to clear weather due to the strong currents encountered throughout this area.

(119) **Chart 13200.**–The inner Nantucket Shoals all lie within the 10-fathom curve. The area is very foul. Only a few of the shoals are described. **Davis South Shoal**, about 20 miles south-southeast of Sankaty Head, consists of two spots of 2¾ and 2½ fathoms about 1.5 miles apart. A buoy is about 1 mile north-northeastward of the 2½-fathom spot. A lighted whistle buoy is about 15 miles southward of the shoal.

(120) **Old South Shoal**, consisting of two spots of 2½ fathoms with a 2-fathom spot and foul ground between them, is about 13.5 miles southeast of Sankaty Head. This shoal is unmarked.

(121) **Charts 13200, 13237.–Great Rip,** about 13 miles east-southeast of Sankaty Head, has depths of 1 to 2¾ fathoms. This shoal is about 7 miles long north and south and 1 to 2 miles wide. A lighted buoy marks its southern end. About 1.5 miles westward of Great Rip and separated from it by depths of 14 to 19 fathoms is an unnamed and unmarked shoal of 1½ to 2½ fathoms. Breakers are usually observed on the shoal.

(122) **Rose and Crown** is a boot-shaped shoal with its southern end about 10.5 miles east of Sankaty Head. The shoal extends about 5 miles northward and then 3 miles westward. Depths of 1¼ and 1½ fathoms are found in the leg of the boot, a depth of ½ fathom and marked by a lighted whistle buoy northeastward of it forms the heel, and a depth of 1¼ fathoms is found in the toe. Northward of the toe of Rose and Crown is a shoal with foul ground and spots of 1½ and 2½ fathoms. Rose and Crown breaks heavily.

(123) **Bass Rip**, about 2.5 miles eastward of Sankaty Head, is about 3.5 miles long north and south. A depth of ½ fathom is 3 miles 115° from the light. The northern end of the shoal has a depth of 2 fathoms. **Old Man Shoal** extends 4.5 miles southwestward from a point 1.5 miles off the southeastern end of Nantucket Island. Depths of 1¼ to 2¾ fathoms are found on this shoal.

(124) **McBlair Shoal,** the northernmost of the Nantucket Shoals and marked on its northern side by lighted buoys, forms part of the southern side of Great Round Shoals Channel. Depths on this shoal vary from 2¼ to 3½ fathoms.

(125) **Great South Channel** is the passage between the easternmost of the Nantucket Shoals and the westernmost shoal spots of Georges Bank. The approximate center of the channel extends from 40°36'N., 68°55'W. to 41°38'N., 68°55'W. The channel is about 27 miles wide and has depths of 19 fathoms and greater throughout, with lesser depths along the eastern and western edges.

(126) **Northern Right Whales.–**Great South Channel lies within the federally designated critical habitat for northern right whales, the most endangered large whale species in the world (fewer than 350 animals). The designated critical habitat delineates the only known area where these whales give birth. (See chart 13200). These slow moving animals are vulnerable to collisions with ships and this is the leading cause of documented mortality for northern right whales. It is recommended that all large vessels (over 100 gross tons) operating in the critical habitat:

(127) (a) Keep a watch for whales during daylight hours.

(128) (b) Monitor NAVTEX transmissions for information on the location of right whales sighted in the vicinity. Local ships' pilots may also provide such information when it is available.

(129) (c) If a right whale is reported within 20 nautical miles of a vessel's intended course, it is recommended that the vessel proceed with caution during the 24 hour period following the time of the sighting. It is known that right whales can accelerate to a speed of approximately 6 knots. When it is believed that a vessel will pass in close proximity of whales, it may be reasonable and prudent to slow a vessel's speed accordingly, when a reduction in speed will not hinder the safe operation of the vessel. (See **50 CFR 226.1, 226.2, and 226.13(a)**, chapter 2, for habitat boundary and regulations.)

(130) The Great South Channel is a feeding area for endangered northern right whales in spring (peak season: April through June).

(131) **Submarine canyons** are indentations in the edge of the **Continental Shelf** which is bounded on its seaward side by the 100-fathom curve. They may be traced from depths of 1,000 fathoms or more to the shoaler areas of the Continental Shelf. The

navigator who has available some means of echo sounding should have in mind the various canyons found in this locality. The soundings in crossing them are very characteristic in each case, and such soundings may be used to determine the vessel's position with considerable accuracy.

(132) The names of some of the most important submarine canyons are shown on the charts. The longitude following the name is approximate and only given to assist in locating the feature on the chart. **Corsair Canyon**, 66°10'W., on the eastern side of Georges Bank, has a northwesterly trend. On the southern side and toward the western end of Georges Bank, having a northerly trend, are **Lydonia Canyon**, 67°40'W.; **Gilbert Canyon**, 67°50'W.; **Oceanographer Canyon**, 68°05'W.; and **Welker Canyon**, 68°30'W. Southeastward and southward of Nantucket Shoals, having a northerly trend, are **Hydrographer Canyon**, 69°00'W.; **Veatch Canyon**, 69°35'W.; and **Atlantis Canyon**, 70°15'W. **Block Canyon**, 71°20'W., is south-southeasterly of Block Island Sound and has a north-northwesterly trend. **Hudson Canyon**, 72°20'W., extends northwestward to the mouth of the Hudson River. The inshore section of this canyon is called **Mud Gorge**.

(133) **Wrecks.**–Many vessels have been wrecked along this coast as a result of collision, foundering, and other causes. Most of the offshore wrecks have been located and wire dragged to determine the least depth over the highest projecting part. Dangerous wrecks for the most part are marked by buoys of various colors and shapes and often show a quick-flashing or an interrupted quick-flashing light.

(134) Many vessels have grounded in fog on the south side of Long Island and on Block Island. Probably many of these wrecks could have been avoided if frequent soundings had been taken in approaching the coast. Vessels equipped to do so should make good use of the electronic aids to navigation systems along the coast to check their position frequently.

(135) **Lobster pots.**–The coastal waters contain numerous lobster pots. Small painted wooden buoys of various designs and colors, secured by small lines, float on the surface; in some cases a second buoy, usually an unpainted wooden stick or bottle and difficult to see, is attached to the lobster pot. These buoys extend from shore out to, and in many cases across, the sailing routes. Small yachts and motor boats are cautioned against fouling them, which is liable to result in a sprung shaft or lost propeller. Fishtraps and fish havens are discussed in chapter 1.

(136) **Fishweirs** are numerous along the outside coast and inside waters. The stakes often become broken off and form a hazard to navigation, especially at night. The areas within which fishweirs are permitted have been established under Federal authority and are shown on charts of 1:80,000 scale and larger. The exact locations of the weirs within the designated areas are not shown. Strangers should proceed with caution when crossing areas of possible fishweirs, and should avoid crossing such areas at night.

(137) **Danger zones** have been established within the area of this Coast Pilot. (See **Part 334,** chapter 2, for limits and regulations.)

(138) **Drawbridges.**–The general regulations that apply to all drawbridges are given in **117.1 through 117.49**, chapter 2, and the specific regulations that apply only to certain drawbridges are given in **Part 117, Subpart B**, chapter 2. Where these regulations apply, references to them are made in the Coast Pilot under the name of the bridge or the waterway over which the bridge crosses.

(139) The drawbridge opening signals (see **117.15**, chapter 2) have been standardized for most drawbridges within the United States. The opening signals for those few bridges that are nonstandard are given in the specific drawbridge regulations. The specific regulations also address matters such as restricted operating hours and required advance notice for openings.

(140) The mariner should be acquainted with the general and specific regulations for drawbridges over waterways to be transited.

(141) **Routes.**–Approaching this section of the coast is dangerous for all vessels because of the off-lying banks and shoals, the strong and variable currents, frequency of fog, and the broken nature of the bottom. Soundings alone are of little value in establishing the position of a vessel, but the depth should be checked frequently to insure that the vessel clears all dangers.

(142) In thick weather especially, the greatest caution is necessary, and vessels equipped to do so should make good and timely use of the electronic aids to navigation systems to check their position frequently. The depth should never be shoaled to less than 15 fathoms without an accurate fix having been obtained, and it is advisable to remain offshore in depths of 20 fathoms or more.

(143) The part of Georges Bank lying between latitude 41°05'N., and 42°00'N., and longitude 67°17'W., and 68°35'W. should be avoided. In heavy weather the sea breaks on the spots with 10 fathoms or less, and strong tide rips are encountered. The tide rips do not always indicate shoal water.

(144) Vessels passing southward of the dangerous part of Georges Bank should keep in 30 fathoms or more. Approaching this part of the bank from eastward or southward, the water shoals gradually. Approaching from the westward, the depths are irregular and the water shoals abruptly in places of 20 fathoms or less. On the north side of Georges Bank between longitudes 66°00'W., and 68°00'W., the 100-fathom and 50-fathom curves are only a few miles apart, and when approaching the dangerous part of the bank from northward 50 fathoms may be taken as a good depth to avoid the shoals.

(145) Vessels equipped with echo sounding devices and following the 100-fathom curve along the south side of Georges Bank can frequently verify their position when crossing the several submarine gorges or canyons.

(146) Approaching New York from the vicinity of Nantucket Shoals Lighted Horn Buoy N, a slight allowance should be made for a southwesterly set of the current. Should the wind be easterly, it is customary to allow, in order to make a course good, a set of the current with it of at least 0.5 knot.

(147) The **North Atlantic Lane Routes** are described in **Pub. No. 140, Sailing Directions, North Atlantic Ocean (Planning Guide),** published by the National Imagery and Mapping Agency, Washington, D.C. They are shown on *Pilot Chart No. 16 of the North Atlantic Ocean.

(148) Deep-draft vessels coming from Cape Hatteras, Chesapeake Bay, Delaware Bay, or New York usually make Nantucket Shoals Lighted Horn Buoy N, thence through Great South Channel to Cape Cod or the Gulf of Maine.

(149) Vessels of medium draft coming from the southward, or southbound from Boston or ports farther east, may use Cape Cod Canal, or Vineyard and Nantucket Sounds via Pollock Rip Channel. Great Round Shoals Channel is also available, but seldom

used, as an entrance to or exit from Nantucket Sound. The controlling depth for these passages is from 27 to 32 feet. They avoid Nantucket Shoals and are used by coasting vessels. Small vessels and pleasure craft usually pass through Long Island Sound when proceeding coastwise.

(150) **Currents.**–The Tidal Current Tables should be consulted for specific information about times, directions, and velocities of the current at the numerous locations throughout the area. It must be borne in mind that the current to which a vessel is subjected at any time is the combination of tidal current, wind current, and other currents such as those due to drainage or oceanic circulation.

(151) Away from the immediate vicinity of the shore, the tidal currents are generally rotary. They shift direction, usually clockwise, at an average rate of about 30° an hour. They attain velocities of 1 to 2.4 knots or more throughout the Nantucket Shoals-Georges Bank area, the larger velocities occurring generally over the shoaler parts of the area. Between Nantucket Island and Sandy Hook their velocities generally do not exceed 0.5 knot except in the vicinities of the entrances to the larger bays and inland waterways, where the velocities increase as the entrances are approached. For considerable distances from the entrances, strengths of flood and ebb set, respectively, toward and away from those entrances, and minimums of velocity, corresponding to the slacks of reversing currents, set at right angles to the directions of the flood and ebb strengths.

(152) Offshore and away from the influence of the tidal flow into and out of the Gulf of Maine and the larger bays, the tidal current maintains an approximate uniform velocity. Shifting its direction continuously to the right, it sets in all directions of the compass during each tidal cycle of 12.4 hours.

(153) In the offshore area between Cape Cod and Sandy Hook there is a resultant southward drift which is stronger in winter than in summer and has an average velocity less than 0.1 knot.

(154) **Wind currents.**–Wind currents are very complicated. Their velocities and directions depend upon a number of factors such as velocity, direction, and duration of the wind, the proximity of the coast and the direction of the coastline. Generally in the Northern Hemisphere the wind-driven current sets somewhat to the right of the wind, but in coastal waters there are many exceptions to this general rule, the current often setting to the left of the wind, due to the tendency of the current to follow the direction of the coastline or to other local conditions.

(155) The velocity of the current relative to that of the wind also varies with the location. It follows, therefore, that local wind current information is desirable. Such information based upon extensive current and wind observations at a number of stations is given in the Tidal Current Tables.

(156) The largest current velocities likely to occur during storms at a number of locations offshore and in the sounds are given as follows: Pollock Rip Entrance Lighted Whistle Buoy PR, 2.5 knots; Stone Horse Shoal, 4 knots; Great Round Shoal Channel Entrance Lighted Horn Buoy GRS, Nantucket Entrance, 2.5 knots; 3 miles north of Nantucket Shoals Lighted Horn Buoy N, 2.5 knots; Cross Rip Shoal, 2.5 knots; Hedge Fence Lighted Gong Buoy 22, Nantucket Sound, 2.5 knots; 3.3 miles southwestward of Cuttyhunk Light, 2 knots; Brenton Reef, 1.5 knots; 0.5 mile south of Bartlett Reef, Long Island Sound, 2.5 knots; 3 miles southward of Cornfield Point, 4 knots; 3 miles north of Nantucket Traffic Lane Lighted Whistle Buoy NB, 1.5 knots; Ambrose Light, 2 knots.

(157) **Weather, Cape Cod to Sandy Hook .**–From Georges Bank and the shoals of Nantucket to New York Harbor, fog, currents, winds and waves are constant threats to safe navigation. The following text describes the weather problems that face the mariner when navigating these waters. This section presents an overall, seasonal picture of the weather that can be expected in the offshore waters along the coast of the mid-Atlantic region from Cape Cod, MA, to Sandy Hook, NJ. Detailed information, particularly concerning navigational weather hazards, can be found in the weather articles in the following chapters.

(158) All weather articles in this volume are the product of the National Oceanographic Data Center (NODC) and the National Climatic Data Center (NCDC). The meteorological and climatological tables are the product of the NCDC. Both centers are entities of the National Environmental Satellite, Data, and Information Service (NESDIS) of the National Oceanic and Atmospheric Administration (NOAA). If further information is needed in relation to the content of the weather articles, meteorological tables or climatological tables, contact the National Climatic Data Center, Attn: Customer Service Division, Federal Building, 151 Patton Avenue, Room 120, Asheville, NC 28801-5001. You may also contact the CSD at 828-271-4994, or fax your request to 828-271-4876.

(159) Climatological tables for coastal locations, meteorological tables for the coastal ocean areas, and a table of mean surface water temperatures and densities relevant to locations discussed within this volume, follow the appendix. The climatological tables are a special extraction from the International Station Meteorological Climate Summary. The ISMCS is a CD-ROM jointly produced by the National Climatic Data Center, Fleet Numerical Meteorology and Oceanography Detachment-Asheville, and the U.S. Air Force Environmental Technical Applications Center, Operating Location-A. The meteorological tables for the ocean areas are compiled from observations made by ships in passage and extracted from the National Climatic Data Center's Tape Deck-1129, Surface Marine Observations. Listed in the appendix are National Weather Service offices and radio stations which transmit weather information.

(160) Marine Weather Services Charts published by the National Weather Service show radio stations that transmit marine weather broadcasts and additional information of interest to mariners. These charts are for sale by the National Ocean Service Distribution Division (N/ACC3). (See appendix for address.)

(161) **Extratropical Cyclones.**–One of the biggest problems in these waters is the winter storm; the most powerful of these is the "Nor'easter". It generates rough seas, strong winds and high tides that threaten safety at sea and cause damage in port. These storms do not often come without warning. Approaching from the U.S. mainland or from the seas to the south they are usually well forecasted. Difficulty arises when they develop or deepen explosively off the mid Atlantic coast. Sometimes called "Hatteras Storms", these lows can grow from small, weak frontal waves to full blown systems in less than 24 hours. Not only can their circulation expand to cover most of the western North Atlantic but they often accelerate rapidly northeastward. In the exposed waters these storms can generate 40-foot (12 m) waves and hurricane force winds. Each year more than 40 extratropical systems move across or close to this coast. They average about two to four per month, but as many as ten can affect the region in a single month. Most systems are weak, but a few generate gales and rough seas

for hundreds of miles; particularly from September through April.

(162) The major winter storm track runs in a line approximately from Cape Hatteras to Cape Cod. Most of the storms that follow this track intensify; the center of intensification is off Delaware Bay. In addition to the forecast certain atmospheric changes indicate a storm is approaching. The most dependable early indicator is falling pressure. A definite weather change is likely if you observe pressure falls exceeding 2 mb every 3 hours; a drop of 5 mb/3 hours indicates a strong change while 10 mb/3 hours warns of an impending extreme event.

(163) As a storm approaches, winds strengthen, clouds thicken and lower and precipitation begins. Early in the storm's life wind waves can become steep very quickly making it difficult to reach port especially when you have to navigate an inlet where breaking waves are treacherous. In deeper waters, waves can build to over 20 feet. During winter the possibility of superstructure icing calls for an early course of action based upon the latest forecast and a knowledge of your vessel.

(164) **Cold Fronts.**–This weather hazard usually approaches from the west through north. Ahead of the front, winds are usually squally and often blow out of the south through southwest. Cirrus clouds give way to Altocumulus or Altostratus and Nimbostratus, then Cumulonimbus. Pressure falls moderately and showers, and perhaps thunderstorms, occur. Seas become choppy. With the frontal passage winds shift rapidly to the west and northwest. Strong gusts and squalls continue. Clearing usually occurs a short distance behind the front as the cold air moves in. Cold fronts can move through the area quite rapidly. Their speed varies from about 10 to 20 knots in summer up to 40 knots in winter. From spring through fall these fronts are often preceded by dense fog.

(165) During the spring and summer when the air ahead of the cold front may be very unstable, a line of thunderstorms, known as a squall line, may develop. These instability lines can form 50 to 300 miles ahead of a fast moving front. They may even contain tornados or waterspouts. These storms can inflict considerable damage on fishing vessels and small craft.

(166) **Tropical Cyclones.**–A tropical cyclone is a warm core, low pressure system that develops over tropical oceans. It exhibits a rotary, counterclockwise circulation in the Northern Hemisphere around a center or "eye". In small tropical cyclones the diameter of the area of destructive winds may not exceed 25 miles while in the greatest storms the diameter may reach 500 miles. At the center is a comparatively calm, sometimes clear, area known as the eye. The diameter of the eye can vary from about 5 to 25 miles. Winds are usually strongest near the center. They can reach 175 knots or more in an intense hurricane. In the North Atlantic Region (West Indies, Caribbean Sea, Gulf of Mexico and waters off the U.S. East Coast) the following terminology is used in tropical cyclone warnings issued by the National Hurricane Center (National Weather Service):

(167) (1) **Tropical Depression**–An organized system of clouds and thunderstorms with a defined circulation and maximum sustained winds of 38 miles per hour (33 knots) or less.

(168) (2) **Tropical Storm**.–An organized system of strong thunderstorms with a defined circulation and maximum sustained winds between 39 and 73 miles per hour (34 to 63 knots).

(169) (3) **Hurricane**.–An intense tropical weather system with a well- defined circulation and a maximum sustained wind speed of 74 miles per hour (64 knots) or greater.

(170) While the following term is not normally used in tropical cyclone advisories it may appear in related products.

(171) (1) **Tropical Wave**.–A minor tropical disturbance in the easterly trade winds, which could develop into a tropical depression but lacks evidence of a closed circulation; also known as easterly wave.

(172) Along the coast, greater damage may be inflicted by water than by wind. Prolonged winds blowing toward shore can increase water levels from about 3 to 10 feet (1 to 3 m) above normal. This storm tide may begin when the tropical cyclone center is 500 miles or more away. It gradually increases until the winds change direction. On top of this the low pressure in the storm's center can create a ridge or wall of water known as a surge. This will move in the direction of the storm's movement and can be disastrous. The effect may be similar to that of a tsunami (seismic sea wave) caused by earthquakes in the ocean floor. Storm surges can push these tides to 20 feet (6.1 m) or more above normal. About 3 to 4 feet (1 to 1.2 m) of this is due to the decrease of atmospheric pressure and the rest to the strong winds. Additional water damage results from the pounding of sea and swell. Torrential rains, generated by tropical cyclones, can cause both flash floods and river floods from inland rains.

(173) **Tropical Cyclone climatology.**–In an average season nine or ten tropical cyclones develop and five of these reach hurricane strength; about two hurricanes reach the U.S. While they may develop in any month, June through November is generally considered the tropical cyclone season, with a peak in August, September and October. Early and pre-season storms, from May through mid July, are most likely to originate in the western Caribbean Sea and Gulf of Mexico. From mid July through late September this development is spread through the main basin of the tropical Atlantic and a much more persistent westerly movement is noticeable. From late September through November, activity gradually confines itself to the Caribbean and Gulf of Mexico. A northerly movement, similar to early season storms, becomes more apparent. However, because of the large reservoir of heat available at the end of the season, these storms are often more intense than their early season counterparts.

(174) The most common path is curved, the storms first moving in a general westward direction, turning later to the northwestward and finally toward the northeast. A considerable number, however, remain in low latitudes and do not turn appreciably toward the north. Freak movements are not uncommon, and there have been storms that described loops, hairpin-curved paths, and other irregular patterns. Movement toward the southeast is rare, and, in any case, of short duration. The entire Caribbean area, the Gulf of Mexico, the coastal regions bordering these bodies of water, and the Atlantic Coast are subject to these storms during the hurricane season.

(175) The average speed of movement of tropical cyclones is about 10 to 15 knots. This speed, however, varies considerably according to the storm's location, development and the associated surface and upper air patterns. The highest rates of speed usually occur in the middle and higher latitudes and range up to 40 to 50 knots. Storms are slowest during recurvature or when looping. They can also become stationary in the absence of steering currents.

(176) **Hurricane Warnings and Forecasts.**–The civilian hurricane warning service for the North Atlantic is provided by the **National Hurricane Center/Tropical Prediction Center**, Miami, Florida. It collates ship, aircraft, radar and satellite data to

produce and issue tropical cyclone warnings and forecasts for the North Atlantic Ocean, including the Caribbean Sea and Gulf of Mexico as well as the Eastern North Pacific Ocean. Its principal product is the Tropical Cyclone Advisory message especially tailored for Marine, Aviation, Military and public interests. They are issued every 6-hours with intermediate bulletins provided when needed.

(177) For tropical storms and hurricane threatening to cross the coast of the U.S., coastal warnings are issued to the public by the National Hurricane Center through local Hurricane Warning Offices in order that defense against damage, and perhaps evacuation, can be implanted. Two levels of warnings are employed. The “Hurricane Watch” is a preliminary alert that a hurricane may threaten a specified portion of the coast. It is issued approximately 36 hours before landfall could occur. The second level is the “Hurricane Warning”, which indicates that hurricane conditions are expected within 24 hours in advance of landfall. It is aimed at providing the best compromise between timeliness and accuracy for civil defense purposes so that its warning may be too late to allow ocean-going vessels to get underway and complete a successful evasion in open water. To compensate for this, the Marine Advisory contains additional guidance in form of probabilities of hurricane strikes, for coastal locations and even offshore coordinates, and storm position forecasts for up to 72 hours in advance.

(178) **Hurricane Havens.**–This section is condensed from the **Hurricane Havens Handbook for the North Atlantic Ocean** published by the Naval Environmental Prediction Research Facility at Monterey, CA. While this study concentrates on New York, NY, New London, CT, and Newport, RI, the climatology and principles of navigation can be applied to the entire region; the navigation information can be applied to winter storms as well. For practical purposes any tropical cyclone that approaches within 180 miles is considered a “threat”. Data is also incorporated from the Global Tropical/Extra tropical Cyclone Climatic Atlas CD-ROM jointly produced by the National Climatic Data Center and the Fleet Numerical Meteorology and Oceanography Detachment-Asheville.

(179) The classical doctrine held by most mariners is that ocean-going ships should leave ports that are threatened by a hurricane. Despite this natural caution, ships continue to be damaged in port or after leaving port, as a result of tropical cyclone encounters. This often stems from the difficulty in forecasting tropical cyclone movement, although these forecasts have improved significantly in the past two decades. In addition to evaluating the forecast it is necessary to assess the risks of remaining in port or putting to sea according to the circumstances of the threat, the facilities of the port and the capabilities of the vessel and crew. For an evaluation as to a course of action, several factors are important. The risk of a particular port experiencing a hurricane is often dependent on seasonal and geographic influences. Forecasts of hurricane movements are more reliable in some areas, particularly the lower latitudes. In the mid latitudes where storms are often recurving, the difficulty increases. It is important to know the sheltering capabilities of the port that is being considered and the speed of advance of tropical cyclones in the latitudes that you may be sailing. When the tropical cyclone speeds approach or exceed vessel speed, options become limited.

(180) Of the 117 tropical cyclones that threatened New York from 1842-1995, 100 occurred from August through October with the main threat in September. The hurricane (winds> 64 knots) threat has a peak in August and September; 81 of the 117 hurricanes occurred in those months. Tropical cyclones usually move in from the south or southwest. During this same period New Haven was threatened by 108 tropical cyclones, 91 of which occurred from August through October. Hurricanes are most likely during August and September when 75 out of the total of 108 occurred. The direction of approach is most likely from the south or southwest. Because of the natural protection offered by the shape of the coast from Cape Cod to Cape Hatteras, most recurving storms either make landfall south of Hatteras or pass New England well offshore to the southeast. The majority of storms pass well to the southeast of New England, following the Gulf Stream. Occasionally storms accelerate on a more northerly track similar to the disastrous hurricane of 1938, which advanced rapidly up the east coast, offshore near Hatteras, across central Long Island, into Connecticut and finally through Vermont. This hurricane’s forward speed reached 52 knots, an advance that would be difficult to prepare for, even with today’s sophisticated warning methods. It is the exceptionally fast-moving storm that poses the greatest threat. For example, based on climatology, a September storm located off Miami would reach New York in about 3 or 4 days. However, the 1938 hurricane traveled this distance in about 30 hours. Tropical cyclones tend to accelerate as they move north of about 30 N. Forward speeds range from 25 to 30 knots for those crossing the New York - New England coast compared to 20 to 25 knots for those passing offshore to the southeast.

(181) Since wind records were available in the New York Harbor area, sustained winds have reached hurricane force (64 knots) only once. The September 1944 hurricane produced 64-knot winds at Central Park and 70-knot winds at La Guardia. Other hurricanes that have caused considerable damage were storms in September 1821, September 1938, August 1954 (Carol) and September 1960 (Donna). During a recent 44-year period along the Connecticut-Rhode Island coast, three hurricanes produced winds that have been estimated to have reached at least minimal hurricane strength. The 1944 hurricane, Carol and the 1938 storm were the three. The 1938 storm was the worst as winds in the New London area were estimated at 78 to 87 knots.

(182) In addition to strong winds, the hurricane brings rough seas, heavy rains, and storm surges. New York’s Lower Bay is subject to wave action due to an open quadrant, east through south, to the Atlantic. The size and depth of the bay also provide sufficient fetch for a strong wind to generate destructive waves. Deep ocean swells approaching from the open quadrant would be reduced by shoals at the entrance to Lower Bay, between Sandy Hook and Rockaway Point. Upper Bay, Newark Bay, lower Hudson River and East River are subject to limited wave action. Long Island Sound is a deep water sound with a generous fetch in an east-west direction. New London Harbor is well protected from wave action. Although a west wind can produce large seas in the Sound they are greatly reduced on entering the harbor channel. Within Narragansett Bay wave action is severely limited by short fetch for most wind directions. Wave action generated within the Bay will create minimal problems for ships at anchor if the scope of chain employed is set to give the best riding conditions.

(183) Storm tides can produce a high water level, which in addition to innundating coastal areas, may allow wind waves to cause destruction in areas normally unaffected by waves. Combined storm surge and tide have produced water levels of over 10 feet (3 m) above mean low water in the New York Harbor area and levels

greater than 15 feet (4.6 m) above mean low water in western Long Island Sound. New London is one of the few east coast ports to have experienced a major storm surge in this century. The storm surge of September 21, 1938 hit New London as an apparent tidal bore (wall of water) causing considerable destruction. This surge was slightly greater than that expected once in a hundred years and was likely due to the fast moving nature of this hurricane. At Newport storm tides were measured at 10.8 feet (3.3 m) above mean sea level during the 1938 hurricane. The top winter extratropical storm produced a 6.0-ft (1.8 m) surge on the 30th of November, 1963.

(184) In summary New York Harbor is recommended as a hurricane haven. It is a large national harbor with many excellent berthing facilities and good deep-water anchorages. Natural topographic features and numerous man-made structures offer good wind protection. The bathymetry and orientation of the harbor relative to the normal path of hurricanes tend to mitigate the wind wave and ocean swell danger although storm surge is a sufficient threat. The main New London harbor is not a haven for most vessels during a hurricane although the inner harbor is considered safe for most ships. The surrounding topography provides some protection from east through southeast winds for the eastern shore of the main and inner harbor, however the lower western shore of the main harbor is very exposed to southeast through south winds. The entire harbor is subject to the possibility of major storm surge flooding. The port of Newport is located inside Narragansett Bay, which has deep water anchorages within its confines. Although these anchorages are not well sheltered from winds, they have proven hurricane haven properties for ships able to steam at anchor.

(185) Flooding associated with hurricane-induced high tides is the principle threat to small craft in the area. They should be hoisted and secured ashore above projected flood levels whenever possible. Best protection is inside some type of storage building to prevent possible damage by flying objects or to prevent the possibility of broken tie-downs in high winds. Local knowledge is the best guide to weathering a storm in small harbors.

(186) **Waves.**–In late March of 1984 a 968-mb Low off the New Jersey coast generated a 33-foot (10.1 m) wave at Buoy 44005 (42.7°N., 68.3°W) while Buoy 41002 (40.1°N., 73.0°W) measured a 47-foot (14.3 m) wave during Gloria in September 1985. Systems similar to these are partly responsible for the rough seas encountered along this coast from September through April. The Buoy closest to the area, 44003, (40.8°N., 68.5°W), in 10 years of operation has measured a 29-foot (8.8 m) wave in February and 25-foot (7.6 m) waves from October through April. It has been estimated that over the open waters along this coast maximum significant waves should reach 30 feet (9 m). The table below (extracted from Marine Weather of Western Washington. Kenneth E. Lilly, Jr., Commander, NOAA, Starpath School of Navigation, 1983) shows the relationship between significant and other wave heights.

(187) This table can be used to project a range of wave heights that might be expected in deep water. If significant wave heights of 10 feet (3 m) are forecast then the most frequently observed waves should be 5- to 6-foot (1.7 - 1.8 m) range while one wave in 100 should reach 17 feet.

Wave Heights from Significant Wave Heights (SWH)

Most frequent wave heights:	0.5 x SWH
Average wave heights:	0.6 x SWH
Significant wave heights (average height of of highest 33%):	1.0 x SWH
Height of highest 10% of the waves:	1.3 x SWH
One wave in 1,175 waves:	1.9 x SWH
One wave in 300,000 waves:	2.5 x SWH

(188) A giant or rogue wave might reach 25 feet (7.6 m) in these circumstances. These rogue or "killer" waves occur when the large number of different waves that make up a sea occasionally reinforce each other. This action creates a wave that is much steeper and higher than the surrounding waves. These rogue waves often occur in a stormy sea and are described by mariners who have experienced them, as coming out of nowhere and disappearing just as quickly. If significant wave heights are observed at 20 feet (6.1 m) then a rogue wave could reach 50 feet (15.2 m) if the water depth could support it.

(189) Rough sea conditions are usually generated by gales out of the northwest through northeast. Waves greater than 8 feet (2.4 m) occur about 10 to 15 percent of the time in winter. From fall through spring, wave heights of more than 7 feet (2.1 m) frequently last one day or more; in midwinter they often last 2 days or more. In addition to coastal storms, cold fronts with rapidly shifting winds can create dangerous seas.

(190) Steep waves are often more dangerous than high waves with a gentle slope. Waves appear menacing when the ratio of wave height to length reach about 1/18. They begin to break when this ratio is about 1/10. Steepest waves develop when strong winds first begin to blow or early in a storm's life. The ship no longer rides easily but is slammed. Steep waves are particularly dangerous to small craft. When wave heights are greater than 5 feet, periods of less than 6 seconds can create problems for boats under 100 feet in length. Waves of 10 feet or more with periods of 6 to 10 seconds can affect comfort in 100- to 200-foot (30.5 to 61 m) vessels. When wind waves reach 20 feet they become hazardous to vessels under 200 feet in length and provide a rough ride for larger ships. Waves moving into shallow water become steeper and break when the depth is about 1.3 times the wave height. Areas such as Nantucket Shoal and Georges Shoals are dangerous in heavy weather. Wave steepness is also increased by tidal currents, particularly when they oppose the wind.

(191) Swells can create problems for larger vessels. About one-half of the waves of 10 feet (3 m) or more, in these waters, are swells from distant storms. They are uncomfortable to ships that roll or pitch in sympathy. Swells with 500- to 1000-foot (152 to 305 m) wave lengths affect ships of these lengths. When steaming into such swells a resonance is set up until the bow digs into the waves. The resulting pitch will cause more of a power loss than a roll caused by a sea. Swells with wave lengths that range from about three-fourths to twice the ships length can have this effect. Pitching is heaviest when the ship's speed produces synchronism between the period of encounter and the ships natural pitching period–this often occurs at or near normal ship speeds.

(192) When in running before a following sea, the greatest danger arises when speed is equal to that of the waves or when the waves overtake the ship so slowly that an almost static situation is created with the vessel lying on the wave crest. In this latter case

stability is so reduced that a small vessel could capsize. Waves on the quarter or astern can also result in very poor steering quality. As seas move along the vessel from aft to forward the rudder is less effective and the boat may be slewed across the face of a sea filling the decks with water as she broaches. She could lose her stability and capsize, particularly if the boat is trimmed by the head.

(193) **Winds.**–Migratory weather systems cause winds that frequently change in strength and direction. In general winds are generally westerly but often take on a northerly component in winter and a southerly one in summer. Strongest winds are generated by lows and cold fronts in fall and winter and by fronts and thunderstorms during spring and summer. Extreme winds are usually associated with a hurricane or severe northeaster and could reach 125 knots. Sustained winds of 100 knots should occur about every 50 years on the average; gusts are usually about 30 percent higher.

(194) In the open seas, away from the influence of land, winds are stronger and less complex. From December through March they are mainly out of the west through north with gales occurring about 6 to 12 percent of the time. Windspeeds, in general, increase with distance from the coast. If winds persist for a long time over a long fetch they will generate rough seas. Winter windspeeds of 20 knots or more persist for more than 12 hours about 50 percent of the time; however these winds often shift and a new fetch is established. Summer winds are usually out of the south through southwest and gales are infrequent. During the spring and fall winds are more variable.

(195) Coastal winds are complex since they are influenced by the topography. Over land speeds are reduced. However channels and headlands can redirect the wind and even increase the speed by funneling the wind. In general you will find southerly components in summer and northerly ones in winter. In sheltered waters like Buzzard Bay, Narragansett Bay and the harbors of Long Island Sound there are a large percentage of calms, particularly during the morning hours. When the existing circulation is weak and there is a difference between land and water temperature, a land-sea breeze circulation may be set up. As the land heats faster than the water, a sea breeze is established during the day; this onshore flow may reach 15 knots or more. At night the land cools more rapidly often resulting in a weak breeze off the land. In many locations the sea breeze serves to reinforce the prevailing summer wind.

(196) **Visibilities.**–Fog, precipitation, smoke and haze all reduce visibilities. Fog is the most restrictive and persistent. It forms when warm, moist air moves across colder water, when very cold air moves over warmer water, or when moist air is cooled to near its dew point by radiation or rainfall. These conditions can be triggered by a number of weather situations.

(197) Prior to the arrival of a cold front there is often a warm, southerly flow of air across cool Gulf waters resulting in dense fog. Warm or stationary fronts can also bring fog while rainfall from lows and fronts can create an evaporation fog. Along the coast radiation fog is common on clear, calm nights although it usually burns off during the morning hours. In the spring, coastal fog may occur near the mouths of rivers and streams that are fed by cold snowmelt.

(198) Sea temperatures increase, in general, from north to south, but the variation is usually only a few degrees over open water. Close to the coast water temperature are usually warmer in summer and colder in winter than offshore readings. Water temperatures in summer range from about 66° to 74°F (18.9 to 23.3°C) while in winter the range is from about 34° to 37°F (1.1 to 2.8°C).

(199) Advection fog is most common in late spring and early summer when south and southwest winds bring warm humid air over the still-cold Labrador Current. Near Georges Bank visibilities fall to less than 1 mile up to 30 percent of the time. While these frequencies drop to the southwest, fog remains a problem in this season.

(200) The areas along the coast, at the heads of bays within the rivers may be comparatively clear while fog is very thick outside. The frequency of fog over land and water is usually in opposition. Land fog is often most frequent in fall and winter compared to the spring and summer maximum of sea fog. Consequently figures for poor visibility at inland or sheltered harbors are no guide to conditions at sea or in the approaches.

(201) **Superstructure Icing**.–Heavy winter weather can cause ice to collect on ships sailing these waters. At its worst superstructure icing can sink a vessel. when air temperature drops below the freezing point of sea water (About 28.6°F) strong winds and rough seas will cause large amounts of sea spray to freeze to the superstructure and those parts of the hull that escape a frequent washing by the sea. Ice amounts increase rapidly with falling air and sea temperatures as well as increasing windspeeds. The most dangerous conditions exist when gales last for several days in temperatures of 28°F or lower. The ice buildup on a trawler can exceed 5 tons per hour.

(202) A moderate rate of ice accumulation usually occurs when air temperatures are equal to or less than 28°F with winds of 13 knots or more. When air temperatures drop to 16°F or below and winds reach 30 knots or greater, ice collects more rapidly. On a 300- to 500-ton vessel it would accumulate at more than 4 tons per hour and is called severe. December, January and February are the worst months. The potential for moderate icing exists about 5 to 10 percent of the time.

(203) In addition to sea spray, ice is also caused by freezing rain or drizzle and fog in freezing conditions. While these two causes could create enough weight on the rigging to cause it to fall, this is minor in comparison with the freezing spray hazard. Icing on the superstructure elevates the center of gravity, decreasing the metacentric height. It increases the sail area and heeling moment due to wind action. Its non-uniform distribution changes the trim. It can hamper steerability and lower ship speed. Icing also creates hazardous deck conditions.

(204) If you can't avoid the weather conditions that cause icing, experience and research have helped develop some guidelines. The first two courses of action when encountering potential icing conditions are to seek shelter from the sea and to steer towards warmer water. Once icing has begun it is prudent to slow down enough so that little or no spray is taken aboard. It is also important to keep ice from building up by whatever means are available. This includes crewmen using tools or baseball bats to remove ice from the deck and superstructure.

(205) Any effort to control the rate of accumulation will buy time. In general heaving to with the bow into the wind and sea as much as possible and varying the course slightly to ensure a minimum symmetrical build up is a good rule. However, experiments have shown that on a trawler with its stern to the wind, loss of stability is only about one-half of that in the ahead condition. When the wind is 30 degrees off the bow the loss of stability is 50 percent greater than in the ahead condition. Also ice accumulates

more rapidly on the windward side causing a heeling into the wind. This listing is partially offset by the action of the wind so that a shift to a reciprocal course after icing has built up could be disastrous. When ice builds up significantly it is important to remember that the removal of one ton of ice 50 feet from the vessels center of gravity is as effective as removing 10 tons of ice 5 feet above the center of gravity.

(206) **Immersion Hypothermia**.–Immersion hypo-thermia is the loss of heat when a body is immersed in water. With few exceptions, humans die if their normal rectal temperature of approximately 99.7°F drops below 78.6°F. Cardiac arrest is the most common direct cause of death. Except in tropical waters warmer than 68° to 77°F, the main threat to life during prolonged immersion is cold or cold and drowning combined.

(207) Cold lowers body temperature, which in turn slows the heartbeat, lower the rate of metabolism, and increases the amount of carbon dioxide in the blood. Resulting impaired mental capacity is a major factor in death by hypothermia. Numerous reports from shipwrecks and accidents in cold water indicate that people can become confused and even delirious, further decreasing their chances of survival.

(208) The length of time that a human survives in water depends on the water temperature and, to a lesser extent, on a person's behavior. The table below shows the approximate human survival time in the sea. Body type can cause deviations, since thin people become hypothermic more rapidly than fat people. Extremely fat people may survive almost indefinitely in water near 32°F if they are warmly clothed.

(209) The cooling rate can be slowed by the person's behavior and insulated gear. In a study which closely monitored more than 500 immersions in the water around Victoria, B.C., temperatures ranged from 39° to 60°F. Using this information it was reasoned that if the critical heat loss areas could be protected, survival time would increase. The Heat Escape Lessening Posture (HELP) was developed for those in the water alone and the Huddle for small groups. Both require a life preserver. HELP involves holding the upper arm firmly against the sides of the chest, keeping the thighs together, and raising the knees to protect the groin area. In the Huddle, people face each other and keep their bodies as close together as possible. These positions improve survival time in 48°F water to 4 hours, approximately two times that of a swimmer and one and one-half times that of a person in the passive position.

(210) Near-drowning victims in cold water (less than 70°F) show much longer periods of revivability than usual. Keys to a successful revival are immediate cardiopulmonary resuscitation (CPR) and administration of pure oxygen. Don't bother with total rewarming at first. The whole revival process may take hours and require medical help. Don't give up! The U.S. Coast Guard has an easy to remember rule of thumb for survival time: 50 percent of people submersed in 50°F water, will die within 50 minutes.

Survival Time Versus Water Temperature

Water Temperature	Exhaustion or Unconsciousness	Expected Time of Survival
32°F	15 min.	15-45 min.
32°-41°F	15-30 min.	30-90 min.
41°-50°F	30-60 min.	1-3 hrs.
50°-59°F	1-2 hrs.	1-6 hrs.
59°-68°F	2-7 hrs.	2-40 hrs.
68°-77°F	3-12 hrs.	3 hrs. - indef.
77°F and above	indefinite	indefinite

Survival Time Versus Water Temperature

(211) **Wind Chill and Frostbite**.–When the body is warmer than its surroundings it begins to lose heat. The rate of loss depends on barriers such as clothing and insulation, the speed of air movement and the air temperature. Heat loss increases dramatically in moving air that is colder than skin temperature (91.4°F). Even a light wind increases heat loss while a strong wind can actually lower the body temperature if the rate of loss is greater than the body's heat replacement rate.

(212) The equivalent wind chill temperature relates a particular wind and temperature combination to whatever temperature would produce the same heat loss at about 3 knots, the normal speed of a person walking. At extremely cold temperatures, wind and temperature effect may account for only two-third of the heat loss from the body. For example, in -40°F temperatures about one-third of the heat loss from the body occurs through the lungs in the process of breathing. On the other hand heat loss is not as great in bright sunlight.

(213) When the skin temperature drops below 50°F, there is a marked constriction of the blood vessels leading to vascular stagnation, oxygen want, and some cellular damage. The first indication that something is wrong is a painful tingling. Swelling of varying extent follows, provided freezing has not occurred. Excruciating pain may be felt if the skin temperature is lowered rapidly, but freezing of localized portions of the skin may be painless when the rate of change is slow.

(214) Cold allergy is a term applied to the welts which may occur. Chilblains usually affect the fingers and toes and appear as reddened, warm, itching, swollen patches. Trench foot and immersion foot present essentially the same picture. Both result from exposure to cold and lack of circulation. Wetness can add to the problem as water and wind soften the tissues and accelerate heat loss. The feet swell, discolor, and frequently blister. Secondary infection is common and gangrene may result.

(215) Injuries from the cold may, to a large extent, be prevented by maintaining natural warmth through the use of proper footgear and adequate, dry clothing; by avoiding cramped positions and constricting clothing; and by active exercise of the hands, legs and feet.

(216) Frostbite usually begins when the skin temperature falls within the range of 14° to 4°F. Ice crystals form in the tissues and small blood vessels. Once started, freezing proceeds rapidly and may penetrate deeply. The rate of heat loss determines the rate of freezing, which is accelerated by wind, wetness, extreme cold, and poor blood circulation. Parts of the body susceptible to freezing are those with surfaces large in relation to their volume, such as toes, fingers, ears, nose, chin and cheeks.

(217) **Optical Phenomena**.–Optical phenomena range from electromagnetic displays to intricate geometrical patterns. The aurora and Saint Elmo's fire are electromagnetic displays. Halos, coronas, parhelia, sun pillars, and related effects are optical phenomena associated with the refraction and diffraction of light through suspended cloud particles; mirages, looming, and twilight phenomena such as the "green flash" are associated with refraction of light through air of varying density. Occasionally, sunlight is refracted simultaneously by cloud suspensions and by

dense layers of air producing complex symmetric patterns of light around the sun. A mirage is caused by refraction of light rays in a layer of air whose density increases or decreases rapidly, near the surface. A marked decrease in density with increasing altitude causes looming, towering, and superior mirages. Looming occurs when objects appear to rise above their true elevation. Objects below the horizon may actually be brought into view. This apparent effect often leads to a serious underestimation of horizontal distances Unimpressive landmarks, and distant ships may acquire startling characteristics through apparent vertical stretching; this phenomenon is known as towering. A superior mirage is so named because of the appearance of an image above the actual object. Ships have been seen with an inverted image above and an upright image floating above that.

(218) Inferior mirages result from the upward bending of light rays in an unstable air mass. This phenomenon is observed locally whenever a superheated land mass or a wide expanse of open water is overrun by cold air. Sinking below the horizon, of relatively close objects, may result in an overestimation of horizontal distances. Occasionally a complicated vertical temperature distribution, may transform hilly coastlines into impressive walls of lofty pinnacles. This phenomenon is known as Fata Morgana. On clear days, just as the upper rim of the sun disappears below the horizon, green light is sometimes refracted from the solar spectrum. This brief phenomenon is called the green flash.

(219) Floating ice crystals (cirriform clouds, light snow flakes, ice fog, or drifting snow) may cause the refraction of light into a variety of faintly colored arcs and halos. This phenomenon, which may be recognized from the fact that the red band is closest to the light source, includes halos, arcs that open toward or away from the sun, mock images, and various geometrical figures that may be located in various parts of the sky with references to the sun.

(220) Fogbows, resulting from refraction through suspended water particles, are seen in the region of the sky directly opposite from the sun, or the antisolar point. These bows, although occasionally brilliantly colored, are normally seen as broad white bands with faintly colored borders. Rainbows are also observed.

(221) When atmospheric particles are about equal in size to the wavelength of light, diffraction is likely to occur. Diffractional phenomena frequently show properties similar to those of refraction except for the reversal in the spectrum colors, violet now being closest to the source of light. The Brocken bow, or glory, appears on clouds or fog banks as a colored ring around the projected shadow of the observers hear. The solar and lunar coronas, which are observed only through high clouds, resemble the halo except that they may assume increasingly larger diameters as the size of the particles decrease. When the light from the sun or the moon diffracted by cirrus or cirrostratus, iridescence may sharply delineate the outline of clouds in brilliant green, blue, pink, orange, or purple.

(222) Refraction of sunlight takes place whenever the intervening particles are larger than the wavelength. Thus, sunlight that is reflected from ice crystals is transformed into sun pillars and parhelic circles. When both phenomena occur in combination they form the remarkable sun cross. Paricelenci circles are observed with moonlight.

(223) The **auroral borealis** (northern lights) and **St. Elmo's fire** are two types of electrical phenomena sometimes observed in this region. The zone of maximum auroral frequency extends along the periphery of a 20- to 25- degree circle whose center is at the magnetic pole. Auroras are generally associated with moonless nights. An artificial maximum exists in winter because of the longer hours of darkness. No conclusive evidence is available to show that a seasonal variation in the frequency of auroras exists. However, periods of intense sunspot activity are reflected in a maximum occurrence of this electrical phenomenon.

(224) Generally auroras may be classified as having either a ray structure (rays, streams, draperies, corona) or a nebulous appearance (homogeneous quiet arc, homogeneous band, pulsating arcs, pulsating arcs, pulsating surfaces, diffuse luminous surfaces, and feeble glow). Flaming auroras, which fall in neither category, may be added to this list. Moreover, auroras may remain uniformly red, green, or purple, or assume a rapid succession of these colors. Brilliant shifting auroras are invariably accompanied by magnetic storms and electrical interference with communications.

(225) St. Elmo's fire is occasionally observed in this area, but because of its faintness it is most commonly observed during the night hours and on dark overcast days. These eerie flickers of bluish light are usually caused by the unusual electrification of the snow-filled air, which is most likely when the wind is strong. St. Elmo's fire is restricted to the tips of such objects as ship masts, wind vanes, and airplane wings.

(226) **Dew Point**.–The temperature at which condensation to water droplets occurs is called the dew point. If this dew point is above freezing, condensation will be in the form of water. When the dew point reaches freezing, ice crystals will be deposited on cold surfaces. Knowledge of the dew point along with cargo temperature and moisture content is vital for hold ventilation decisions. It is also a parameter used in forecasting fog formation.

(227) **Cargo Care**.–When free air has a dew point temperature higher than the temperature of the surface with which it comes in contact, the air is often cooled sufficiently below its dew point to release moisture. When this happens on board ship, condensation will take place on relatively cold cargo or on the ship's structure within the hold where it later drips onto the cargo. Thus, if cargo is stowed in a cool climate and the vessel sails into warmer waters, ventilation of the hold with outside air will likely lead to sweat damage in any cargo sensitive to moisture. Under such conditions external ventilation should, as a rule, be closed off entirely, unless the cargo generates internal heat, that hazard being greater than sweat damage. In the opposite case, when a vessel is loaded during a warm period, and moves into cooler weather, vulnerable cargo should be ventilated.

(228) A safe rule for ventilation directed toward moisture control may be stated as follows: Whenever accurate measurements show the outside air has a dew point below the dew point of the air surrounding the cargo to be protected, such outside air is capable of removing moisture from the hold and the ventilation process can be safely started. Whenever the reverse is true, and the outside dew point is higher than the dew point temperature around the cargo, then ventilation will increase the moisture content of the hold and may readily result in sweating within the ship. The above does not take into account possible fumes or gases in the compartment. In such cases discretion must be used.

(229) **Ice.**–(Refer to discussion under ports affected.)

(230) During some winter months or when threatened by icing conditions, lighted buoys may be removed from station or re-

placed by unlighted buoys; unlighted buoys, and daybeacons and lights on marine sites also may be removed. (See Light List.)

(231) The **International Ice Patrol (IIP)** was formed in 1914 to patrol the Grand Banks of Newfoundland to detect icebergs and warn mariners of their location. Under the 1974 Safety of Life at Sea (Solas) Convention, 20 member-nations agreed to share the $2.5 million annual cost of operating the patrol. The U.S. Coast Guard conducts the patrol and maintains IIP records.

(232) Today the IIP is coordinated from its operations center at Groton, Connecticut. Its staff presently numbers 13, including Coast Guard and civil service specialists. The usual ice season runs from March through September but can vary. Flying out of the Canadian Forces Base at Gander, Newfoundland, USCG aircraft cover the ice area, a piece of water twice the size of the State of Texas. Its southern boundary is nearly the latitude of New York City and it reaches halfway across the Atlantic, with Newfoundland on the northwest and Greenland and Iceland on the north and northeast. A normal flight lasts seven hours and can cover 35,000 square miles.

(233) Once sighted, a berg's location, size, and configuration all are entered into a computer drift model, used until it is resighted or melts.

(234) The IIP attempts to locate and track bergs south of the 52nd parallel, and particularly those south of the 48th which may be hazardous to navigation near the Grand Banks. When sighting data is entered into the drift program, predicted positions of bergs are calculated at 0000 and 1200 GMT.

(235) All shipping is requested to assist in the operation of the IIP by radio reporting all sightings of ice at once to the IIP through any U.S. Coast Guard communications station. Ice sightings reports should include: precise position, size and shape of berg, concentration of ice, and thickness of ice (refer to IIP chart for filing reports). A list of the radio stations broadcasting IIP Bulletins and frequencies and times of broadcasts is published annually in Local Notices to Mariners of the First and Third Coast Guard Districts and in Radio Navigational Aids, Pub. 117, issued by the National Imagery and Mapping Agency.

(236) The IIP operations center can be reached by telephone at (203) 441-2626, or the Coast Guard Operations Center in New York at (212) 668-7878. Vessels carrying Marisat equipment can send messages at their own expense to COAST GUARD NY (Telex 126831).

(237) Once daily, a radio facsimile chart of the area depicting ice distribution is broadcast. The IIP seeks comments on its services to mariners, particularly on the effectiveness of the times and frequencies of radio transmissions. Mariners are requested to mail facsimile charts received at sea to International Ice Patrol, 1082 Shennecossett Road, Groton, CT 06340-6095. The frequency used, time of receipt, and vessel position at time of receipt should be indicated.

SIZES OF ICEBERGS

SIZE		HEIGHT		LENGTH	
		(feet)	(meters)	(feet)	(meters)
Growler	(G)	0-3	0-1	0-19	0-5
Small	(S)	4-50	1-15	20-200	6-60
Medium	(M)	51-150	16-45	201-400	61-122
Large	(L)	151+	46+	401+	123+

TYPES OF ICEBERGS

SHAPE		DESCRIPTION
Blocky	(B)	Steep sides with flat top. Very solid. Lenght-height ratio less than 5:1
Tilted Blocky	(V)	Blocky iceberg which has tilted to present a triangular shape from the side.
Drydock	(K)	Eroded such that a large U-shaped slot is formed within twin columns. Slot extends into or near waterline.
Pinnacled	(P)	Large central spiral or pyramid
Dome	(D)	Large round smooth top. Solid-type iceberg.
Tabular	(T)	Flat-topped iceberg with length-height ratio greater than 5:1.

(238) **Principal ports.**–The principal deep-draft commercial ports within the area of this Coast Pilot are: New Bedford and Fall River, Mass.; Tiverton and Providence, R.I.; New London and Bridgeport, Conn.; New York, Albany and Port Jefferson, N.Y.; and Elizabeth and Newark, N.J.

(239) Other deep-draft facilities are located on Cape Cod Canal; Narragansett Bay; off Northville and Northport, N.Y., on Long Island Sound; and on the Hudson River between New York City and Albany, N.Y.

(240) **Pilotage,** with few minor exceptions, is compulsory for all foreign vessels and U.S. vessels under register entering and departing the Port of New York and New Jersey and other ports within the area of this Coast Pilot, and for all such vessels transiting Block Island Sound, Narragansett Bay, and Long Island Sound. (See **207.20,** chapter 2, for Pilotage Regulations on the Cape Cod Canal.)

(241) Pilotage is optional for coastwise vessels that have on board a pilot properly licensed by the Federal Government for the waters which the vessel travels.

(242) Arrangements for pilots should be made by the ships' agents at least 24 hours in advance at all of the ports. New York is the only port at which the pilot boat remains on station. Detailed information on pilotage procedures is given in the text for the ports concerned.

(243) **Towage.**–Tugs are available at all major ports; they can usually be obtained for the smaller ports on advance notice if none are available locally. Arrangements for tugs should be made in advance through ships' agents or the pilots. (See the text for the ports concerned as to the availability of tugs.)

(244) **Vessel Arrival Inspections.**–Quarantine, customs, immigration, and agricultural quarantine officials are stationed in most major U.S. ports. (See appendix for addresses.) Vessels subject to such inspections generally make arrangements in advance through ships' agents. Unless otherwise directed, officials usually board vessels at their berths.

(245) **Harbormasters** where appointed are mentioned in the text. They usually have charge of the anchorage and berthage of vessels.

(246) **Supplies.**–General supplies, including fuel oil, diesel oil and fuel, gasoline, water, and marine supplies are available at the principal ports. Similar items but in more limited quantities can be obtained at many places mentioned under descriptions of the different ports.

(247) **Repairs-salvage-wrecking.**–Complete facilities for large vessels are available in New York Harbor. The extent and

types of facilities at other places are shown in the text under the description of the ports.

(248) **Small-craft facilities.**–There are numerous places where fuel, supplies, repairs, slips for dockage, and launching ramps are available for small craft. For the various towns and isolated places, the Coast Pilot includes generalized information about marine facilities; details are given in the series of small-craft charts published for many places.

(249) **A vessel of less than 65.6 feet (20 meters) in length or a sailing vessel shall not impede the passage of a vessel that can safely navigate only within a narrow channel or fairway. (Navigation Rules, International-Inland Rule 9(b)).**

(250) **Standard Time.**–The area covered by this Coast Pilot uses eastern standard time (e.s.t.), which is 5 hours slow of Greenwich mean time (G.m.t.). Example: When it is 1000 at Greenwich it is 0500 at New York City.

(251) **Daylight saving time.**–Throughout the area of this Coast Pilot, clocks are advanced 1 hour on the first Sunday in April and are set back to standard time on the last Sunday in October.

(252) **Legal public holidays**.–New Year's Day, January 1; Martin Luther King, Jr.'s Birthday, third Monday in January; Washington's Birthday, third Monday in February; Memorial Day, last Monday in May; Independence Day, July 4; Labor Day, first Monday in September; Columbus Day, second Monday in October; Veterans Day, November 11; Thanksgiving Day, fourth Thursday in November; and Christmas Day, December 25. The national holidays are observed by employees of the Federal Government and the District of Columbia, and may not be observed by all the States in every case.

(253) In addition, the following holidays are also observed in the States covered by this Coast Pilot:

(254) Lincoln's Birthday, February 12: Connecticut, New Jersey, and New York.

(255) Evacuation Day, March 17: Massachusetts, Boston and Suffolk County only.

(256) Good Friday: Connecticut and New Jersey.

(257) Patriots Day, third Monday in April: Massachusetts.

(258) Rhode Island Independence Day, May 4: Rhode Island.

(259) Bunker Hill Day, June 17: Massachusetts, Boston and Suffolk County only.

(260) Victory Day, second Monday in August: Rhode Island.

(261) General Election Day, first Tuesday after the first Monday in November: New Jersey, New York, and Rhode Island.